



NRDC Comments on VA DEQ's Proposed Regulation for Emissions Trading

(9 VAC 5 Chapter 140, Rev. C17)

March 6, 2019



On behalf of our over 10,000 paying members across the Commonwealth and Acadia Center, the Natural Resources Defense Council strongly supports the promulgation of the Department of Environmental Quality's regulatory action ("Regulation for Emissions Trading").

In particular, NRDC supports both:

- (1) the DEQ's revised 28 million baseline,¹ and
- (2) DEQ's removal² of Governor Northam's arbitrary exemption of emissions from coal facilities that co-fire with woody biomass, as coverage of biomass emissions conforms with both the model rule of the Regional Greenhouse Gas Initiative (RGGI),³ and with the Air Pollution Control Board's recent unanimous vote.⁴

Most importantly and fundamentally, NRDC supports the rule's direct incorporation into the already-successful, ongoing RGGI program. By participating in that larger market, net costs in Virginia will be minimized or even eliminated, as RGGI states have done through efficiency investment. The larger RGGI market enables the sale of Virginia-based allowances, if Virginia emissions are lower than expected. In the event emissions are higher than expected, the larger market enables lower allowance prices. The expected minimal, even negative, costs of compliance are outlined in greater detail below in NRDC's transparent, industry-grade IPM modelling results.⁵

However, any such regulatory costs can be even further minimized, if Virginia elects to invest in energy efficiency to reduce demand and the cost of allowances. RGGI states have already successfully done so,⁶ lowering the overall costs under that popular, decade-old program,

¹ 9 VAC 5-140-6190.

² 9 VAC 5-140-6040.

³ RGGI Model Rule, XX-1.4 ("Applicability"), available at https://www.rggi.org/sites/default/files/Uploads/Design-Archive/Model-Rule/2017-Program-Review-Update/2017_Model_Rule_revised.pdf.

⁴ See Air Pollution Control Board meeting minutes from October 29, 2018, ("Approved for public comment *with Board changes* to the repropoed regulation" Emphasis added, available at http://townhall.virginia.gov/L/GetFile.cfm?File=Meeting\1\28304\Minutes_DEQ_28304_v1.pdf.

⁵ See Appendix, *infra*.

⁶ The Analysis Group, "The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States," April 17, 2018, at 4-13, available at https://www.analysisgroup.com/globalassets/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_april_2018.pdf.

which has generated net economic benefits.⁷ Therefore, DEQ must, in direct partnership with the utilities, State Corporation Commission (SCC) Staff, and others, identify how Virginia's own program can similarly reduce Virginia's rising electric bills, by replicating RGGI's well-documented success.

Lastly, DEQ should be extremely skeptical of sensationalist, non-transparent claims of high cost impacts due to the carbon pollution reductions DEQ has proposed.

For example, in 2014, SCC Staff erroneously claimed similar carbon reductions would cost Virginians the sum of \$6 billion dollars.⁸ While SCC Staff later disavowed that outlier estimate as over-inflated, utilities subsequently relied on such dramatic estimates to justify a very-costly legislative freeze of refunds owed from customer overearnings.⁹

In short, bad facts make bad policy.

Nonetheless, SCC Staff recently made another outlier claim of, again, a nearly \$6 billion carbon compliance cost (an estimate that exceeds Dominion's own statewide cost estimate by a multiple of twelve). It remains unclear how SCC Staff arrived at such an unlikely high cost figure. Regardless of the particulars of the SCC's undisclosed analysis, it is out of coherence with the modern-day realities of Virginia's carbon-based power mix.

For example, SCC Staff's nearly \$6 billion cost impact claim fails to take into account that in 2018, due to market forces alone, only one Virginia coal plant exceeded a 40% capacity factor.¹⁰

Due to those market forces, which are clearly not reflected in SCC Staff's estimate, coal plants now comprise less than 10% of Virginia's generation mix.¹¹ Because coal generation has nearly phased itself out of the marketplace, and the cost of zero-carbon renewables and efficiency are now the least-cost new resources, it is unclear how SCC Staff credibly arrived at such an outlier cost estimate.

In setting policy, therefore, DEQ should continue to rely on transparent, credible analyses, which accurately reflect the reality of today's cheaper, cleaner electric grid.

⁷ *Id.*

⁸ See SCC formal comments on U.S. EPA's Clean Power Plan, October 14, 2014, *available at* https://gallery.mailchimp.com/a8970db37d2569f1a2b65e59d/files/Virginia_SCC_Staff_Comments_on_Clean_Power_Plan.pdf.

⁹ Senate Bill 1349, *available at* <https://lis.virginia.gov/cgi-bin/legp604.exe?151+sum+SB1349>.

¹⁰ At a 54% capacity factor, VCHEC was the only Virginia coal plant able to exceed a 40% capacity factor in 2018: U.S. Energy Information Administration (EIA), Form EIA-923, January 8, 2019, *available at* <https://www.eia.gov/electricity/data/eia923/>.

¹¹ NRDC analysis based on U.S. Energy Information Administration (EIA), *Electric Power Monthly* (with data for December 2018), Table 1.4.B. Net Generation from Coal, Table 1.17.B. Net Generation from Solar Photovoltaic, & Table 1.3.B. Net Generation from Utility-Scale Facilities by State, *available at* <https://www.eia.gov/electricity/monthly/>.

Recommendation 1: Retain the Revised 2020 Baseline of 28 Million Tons

NRDC's IPM modeling, conducted by ICF, predicts the same Virginia emissions in 2020 as that indicated by DEQ's own analysis: NRDC's IPM modeling for Virginia projects the state's power sector emissions to be 28.0 million short tons in 2020.

This modelling accurately reflects the reality of today's power sector in Virginia. First, in-state coal units no longer compete on the open market, and thus no longer have an outsized impact on statewide emissions under business-as-usual conditions. Specifically, and as stated above, only one Virginia coal plant exceeded a 40% capacity factor in 2018 (VCHC, at 54%).¹² As such, coal units now account for less than 10% of Virginia's annual generation.¹³

Meanwhile, renewable energy installations – most notably solar energy – are steadily increasing in Virginia. In 2018, Virginia's solar capacity grew by 158%, the fourth-highest growth in the nation.¹⁴ This is largely due to the steady decline in the cost of renewables, with utility scale solar costs falling 13% last year (on top of an 88% drop in the past nine years).¹⁵

The steep decline in coal generation and renewables costs is concurrent with lower demand growth projections across the state and region.¹⁶ As a result, the U.S. EIA's Annual Energy Outlook 2019, for example, anticipates carbon emissions in the Virginia-Carolina region will already decrease by 35% from 2017 levels by 2021.¹⁷

Combined, the factors of lower in-state electricity demand growth, persistently declining gas prices, and growing low-cost renewables (and their impact on coal's ability to compete in the marketplace), make 28.0 million tons a sensible starting point for the program, one that reflects the reality of today's energy marketplace.

As discussed further in the Appendix, a sufficiently ambitious program will also drive significant economic and health benefits, including lower energy bills and rates, as well as improved public health resulting from cuts in co-pollutants like NO_x and SO₂.

¹² U.S. Energy Information Administration (EIA), Form EIA-923, January 8, 2019, available at <https://www.eia.gov/electricity/data/eia923/>.

¹³ NRDC analysis based on U.S. EIA, *Electric Power Monthly* (with data for December 2018), Table 1.4.B. Net Generation from Coal, Table 1.17.B. Net Generation from Solar Photovoltaic, & Table 1.3.B. Net Generation from Utility-Scale Facilities by State, available at <https://www.eia.gov/electricity/monthly/>.

¹⁴ U.S. EIA, *Electric Power Monthly* (with data for December 2018), Table 1.17.B ("Net Generation from Solar Photovoltaic"), February 27, 2019, <https://www.eia.gov/electricity/monthly/>.

¹⁵ Lazard, "Levelized Cost of Energy and Levelized Cost of Storage 2018," November 2018, available at <https://www.lazard.com/media/450784/lazards-levelized-cost-of-energy-version-120-vfinal.pdf>.

¹⁶ See, e.g., EIA Electricity Sales Data for 2017, available at <https://www.eia.gov/electricity/data/eia861m/>.

¹⁷ U.S. EIA, *Annual Energy Outlook 2019*, January 2019, https://www.eia.gov/outlooks/aeo/tables_ref.php. See Table 55.16 of the Reference Case for all electric power projections for the VACAR (Virginia-Carolina) Electricity Market Module Region.

Recommendation 2: Carbon Emissions from Co-firing Forest-derived Biomass Should Be Covered by the Regulation

The DEQ's proposed rule clearly requires that co-firing facilities hold allowances for the carbon dioxide (CO₂) they emit, whether those emissions be from forest-derived biomass or fossil fuels.¹⁸

While Governor Northam unexpectedly removed the rule's coverage of biomass co-firing emissions in the version presented to the Air Pollution Control Board on October 29, 2018, the Air Board rightly voted to remove that newly-inserted exemption of biomass co-firing.¹⁹

(It should be noted that the DEQ inaccurately describes an "*exemption* of fossil fuel units that co-fire with biomass" in its current published summary of the regulation,²⁰ a description that is at odds with the plain language wording of the regulation²¹ and the clear and binding intent of the Air Pollution Control Board.)

The Air Board and DEQ's coverage inclusion of biomass co-firing under the rule is both sensible and reasonable. Forest-derived biomass is not categorically a "carbon neutral" fuel, so its emissions cannot be assumed to be zero. Stack emissions of CO₂ from burning forest-derived biomass are typically comparable to, or greater than, coal per unit of energy produced (due to the inefficiency of biomass combustion), even according to industry analyses.²²

The following chart, showing EIA's fuel emissions factors per unit fuel energy content, demonstrates the carbon intensity of biomass, with biomass accounting for the top three highest-emitting categories of solid fuel per unit of energy production:

¹⁸ See 9 VAC 5-140-6040 ("Applicability") and DEQ definitions of "Fossil fuel-fired," "CO₂ budget unit," and "Unit."

¹⁹ See Air Pollution Control Board meeting minutes from October 29, 2018, ("Approved for public comment *with Board changes* to the repropoed regulation" (emphasis added), available at http://townhall.virginia.gov/L/GetFile.cfm?File=Meeting\1\28304\Minutes_DEQ_28304_v1.pdf.

²⁰ Virginia Register of Regulations, February 4, 2019, at 1409 ("Summary"), available at <http://register.dls.virginia.gov/vol35/iss12/v35i12.pdf>, (emphasis added).

²¹ 9 VAC 5-140-6040 ("Applicability") and DEQ definitions of "Fossil fuel-fired," "CO₂ budget unit," and "Unit."

²² Kinney, Suz-Anne, "Wood vs. Coal: Moisture Content and Carbon Emissions," Forest2Market Market Watch, February 14, 2012, <https://blog.forest2market.com/wood-vs-coal-moisture-content-and-carbon-emissions>

Fuel code	Fuel	lb/MMBtu
OBS	other biomass solids	233
BLQ	black liquor	222
WDS	wood solids	207
BIT	bituminous coal	206
MSB	biogenic muni waste	200
MSN	non-biogenic muni waste	200
SLW	sludge waste	185
DFO	distillate fuel oil	163
RFO	residual fuel oil	163
LFG	landfill gas	130
OBG	other biomass gases	127
NG	natural gas	117

The assertion that biomass is a “carbon neutral” source of energy has been falsely promoted by the Trump administration²³ and more generally by industry interests. These assertions have been widely rejected in the scientific peer-reviewed literature, which has shown that most forms of forest-derived biomass increase CO₂ emissions in the atmosphere for many decades to centuries.²⁴ In particular, assumptions about the categorical “carbon neutrality” of biomass from managed forests have been rejected by the EPA’s own Scientific Advisory Board.²⁵

If Virginia were to exempt all biomass, including co-firing, from the rule – even if deferring biomass policy formulation until some later time – its action would send a damaging signal that crucial, state-level carbon trading rules can nonetheless embrace the anti-science policies of the Trump administration.

We therefore urge the DEQ to maintain its coverage of co-fired biomass in the rule as proposed, and in line with the Air Board’s binding vote on the matter on October 29, 2018.

Biomass co-firing coverage as proposed in the current revised rule is also consistent with DEQ’s past actions in this regulatory process. DEQ has consistently asked in past and current comment periods for specific input on how to cover biomass emissions under the rule.

Indeed, biomass coverage has always been explicitly contemplated and therefore expected, starting with Executive Order 57, entitled “Development of Carbon Reduction Strategies for *Electric Power Generation Facilities*,” and continuing with Executive Directive 11, entitled “Reducing Carbon Dioxide Emissions from the *Electric Power Sector* and Growing Virginia’s Clean Energy Economy” (emphasis added).

²³ US EPA, *Treatment of Biogenic Carbon Dioxide Emissions from Stationary Sources Use Forest Biomass for Energy Production*, April 23, 2018, available at www.epa.gov/sites/production/files/2018-04/documents/biomass_policy_statement_2018_04_23.pdf.

²⁴ John Gunn, et al., *Scientific Evidence Does Not Support the Carbon Neutrality of Woody Biomass Energy: A Review of Existing Literature*, Spatial Informatics Group Report 2018-01, October 2018, available at www.signal.org/reports-and-tools.

²⁵ US EPA, Scientific Advisory Board, *Review of EPA’s Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources*, September 28, 2012, available at [https://yosemite.epa.gov/sab/sabproduct.nsf/0/57B7A4F1987D7F7385257A87007977F6/\\$File/EPA-SAB-12-011-unsigned.pdf](https://yosemite.epa.gov/sab/sabproduct.nsf/0/57B7A4F1987D7F7385257A87007977F6/$File/EPA-SAB-12-011-unsigned.pdf).

Just as important as maintaining this well-established intent, covering emissions from biomass co-firing is consistent with RGGI policy, with which DEQ rightly seeks to align. The RGGI program requires participants to count emissions from biomass when it is co-fired with fossil fuel (while also providing an exemption from the requirement for “eligible” feedstocks under prescribed circumstances).²⁶ To avoid unnecessary litigation and to align with that larger market, DEQ should unambiguously avoid arbitrary polluter exemptions and retain biomass co-firing coverage in its final approved rule, in keeping with the Air Board’s October 29, 2018 vote.

Recommendation 3: The DEQ Should Monitor Potential Shifting of Emissions Out-of-State

The DEQ should work to ensure the integrity of the program is not eroded by emissions “leakage.”

Leakage is the increase of emissions from power plants outside Virginia to supply in-state load due to a carbon price on in-state generation, beyond business-as-usual import levels *absent* a Virginia carbon price.

The DEQ can best avoid leakage by (1) designing an economically efficient program with minimal market distortions; (2) ensuring consumer benefits are maximized through efficiency investments; and (3) driving significant levels of in-state, cost-effective renewable energy development. These will all deliver least-cost carbon reductions and mitigate the impact of carbon prices on the flow of carbon-derived power flows across state lines.

To verify the program does not inadvertently lead to increased fossil-based electricity imports from out-of-state, the DEQ should establish an annual program review process for the duration of the program, to assess whether interstate power flows are shifting *as a result of the carbon price*. Importantly, a modest price on carbon is but one of many variables that can influence interstate power flows; therefore, any such analysis would also need to account for other potential factors (including changes in fuel prices and potential changes in both load and generation in the interconnection region), in order to draw appropriate attribution conclusions.

RGGI has already built in such emissions monitoring and reporting that assesses changes in power flows, and we urge Virginia to do so as well.²⁷

²⁶ RGGI Model Rule, XX-8.7 (“CO₂ budget units that co-fire eligible biomass”), available at https://www.rggi.org/sites/default/files/Uploads/Design-Archive/Model-Rule/2017-Program-Review-Update/2017_Model_Rule_revised.pdf.

²⁷ See, e.g., RGGI, *CO₂ Emissions from Electricity Generation and Imports in the Regional Greenhouse Gas Initiative: 2016 Monitoring Report*, December 2018, available at https://www.rggi.org/sites/default/files/Uploads/Electricity-Monitoring-Reports/2016_Elec_Monitoring_Report.pdf.

Recommendation 4: Ongoing Review of the Program Should Include an Assessment of Benefits Delivered to Environmental Justice Communities

Climate change is inherently an environmental justice issue, as coastal communities and low-income communities ultimately bear the worst brunt of its impact. Therefore, the program should make significant cuts to carbon dioxide and ensure the consumer and energy efficiency benefits flow to the low-income citizens most impacted not just by climate change, but energy costs as well.

Additionally, because carbon dioxide is not harmful in locally-higher concentrations, and there do not appear to be specific Virginia plants in proximity to at-risk communities whose capacity factors will increase under a carbon program, a carbon market in Virginia appears unlikely to create “hot spots” of pollution in frontline communities. And as the cap for carbon emissions is lowered, it can also create additional benefits of further reducing associated co-pollutants that cause health problems in communities close to their source.

To ensure this is the case over the course of the program, we support the DEQ’s inclusion of environmental justice review within the program.²⁸

²⁸ 9 VAC 5-140-6440.

Appendix

IPM Modeling Results: 2020 Emissions Baseline of 28.0 Million Tons, and the Benefits of a RGGI-linked Carbon Limit

As shown below, mitigating climate change in the manner as outlined in the revised rule, by capping and annually reducing carbon pollution and linking to the already-successful RGGI program, will drive significant additional economic and health benefits in the Commonwealth.

Those benefits include but are not limited to direct economic benefits in the form of lower electricity bills, and indirect economic benefits in the form of increased public health. The state will also benefit from increased energy sector diversity and from job growth associated with finally tapping into Virginia's considerable renewable energy and energy efficiency potential in a meaningful way.

The state's policy of increasing its energy independence can also be advanced through this regulation, by prioritizing and supporting the development of native Virginia clean energy resources – energy efficiency, solar, and wind energy – and sending fewer dollars out-of-state to import carbon-intensive gas.

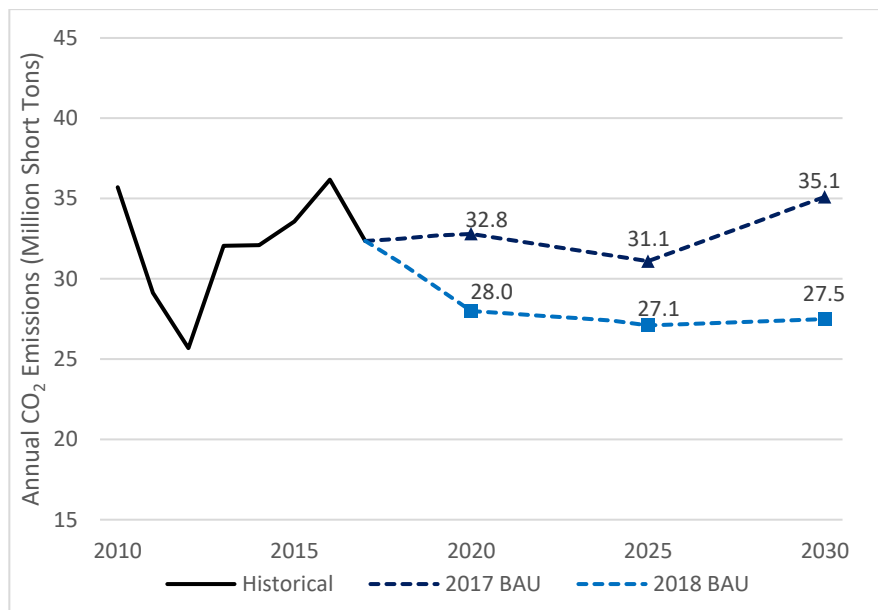
To fully realize the rule's environmental and economic benefits for the Commonwealth, the DEQ is correct to set a meaningful initial baseline budget of 28.0 million tons in 2020. Already in Virginia, the coal fleet's capacity factor average in 2018 was far below 50%,²⁹ with coal units supplying less than 10% of the state's generation.³⁰ Accordingly, federal projections from the U.S. EIA, for example, anticipate a 35% decrease in power sector emissions between 2017 and 2021 in the combined Virginia-Carolina region.³¹

This finding of significantly decreasing emissions, under business-as-usual conditions, corresponds with NRDC's IPM modeling, as shown below in Figure 1.

²⁹ See U.S. EIA, Form EIA-923, January 8, 2019, available at <https://www.eia.gov/electricity/data/eia923/>.

³⁰ NRDC analysis based on U.S. Energy Information Administration (EIA), *Electric Power Monthly* (with data for December 2018), Table 1.4.B. Net Generation from Coal, Table 1.17.B. Net Generation from Solar Photovoltaic, & Table 1.3.B. Net Generation from Utility-Scale Facilities by State, available at <https://www.eia.gov/electricity/monthly/>.

³¹ U.S. EIA, *Annual Energy Outlook 2019*, January 2019, https://www.eia.gov/outlooks/aeo/tables_ref.php. See Table 55.16 of the Reference Case for all electric power projections for the VACAR (Virginia-Carolina) Electricity Market Module Region.

Figure 1: Historical and NRDC’s IPM-modeled Projected Power Sector Carbon Emissions

Historical data above derived from EPA’s Continuous Emissions Monitoring System. Both 2017 and 2018 BAU modeling reflect IPM outputs for years 2020, 2025, and 2030. Both BAU cases assume no carbon price or policy in the state of Virginia during the modeling period.

NRDC retained ICF to conduct modeling with ICF’s Integrated Planning Model (IPM®), which includes the projections in the above Figure 1.³² This modeling is a continuation of and update to NRDC’s prior modeling efforts with ICF, including for the federal Clean Power Plan and the DEQ’s previous NOIRA comment period for this rule.

This modeling, including the figure above, incorporated the most recent assumptions, all chosen by NRDC, at the time of modeling. This includes lower gas prices and lower demand projections in EIA’s Annual Energy Outlook (AEO) 2018.

So that the IPM modeling results can be fully understood in the context of the underlying assumptions, below is a transparent summary of the primary assumptions as specified by NRDC. (See Table 1 below.)

³² ICF’s Integrated Planning Model (IPM®) is a detailed model of the electric power system that is used routinely by the electricity industry and regulators, including RGGI, to assess the effects of environmental regulations and policy. IPM® determines the most cost-effective pathway for the electricity industry, subject to reliability requirements and environmental constraints, and economically builds & retires new electricity capacity. The outputs of IPM® modeling include carbon and other pollutants, wholesale electricity prices, natural gas prices, retail bills, electricity generation by fuel type, & capacity retirements & builds. The modeling presented here reflect an NRDC analysis conducted by ICF. All assumptions and policy scenarios were developed by NRDC.

Table 1: NRDC's Modeling Assumptions

Modeling Assumptions		
Element	2017 Reference Case	2018 Reference Case
Builds, Retirements, and State Policies	Reflects announcements and state policies as of Q2 2017	Reflects announcements and state policies as of Q1 2018
Demand	AEO 2017 Reference Case without the Clean Power Plan	AEO 2018 Reference Case without the Clean Power Plan
Natural Gas Prices		
Technology Costs	Wind and solar costs from NREL'S 2017 Annual Technology Baseline; all other costs from AEO 2017. ITC/PTC extension included in renewable energy costs.	Wind and solar costs from NREL'S 2017 Annual Technology Baseline; all other costs from AEO 2018. ITC/PTC extension and solar tariffs included in renewable energy costs
Nuclear	60 year life (no extension to 80 years allowed)	Extension to 80 year life allowed
Wind	Wind limit in VA (only 750 MW of new wind can be built).	Wind limit in VA (only 750 MW of new wind can be built). Model breaks reported wind down into offshore and onshore wind.
Energy Efficiency	Only savings included in AEO2017 baseline (e.g. no incremental savings added)	Only savings included in AEO2018 baseline (e.g. no incremental savings added)
Battery Storage	No Ability to Model Storage	Ability to Model and Economically Build 4hr Battery Storage
Carbon Cap	No cap on Virginia emissions	No cap on Virginia emissions
RGGI Participation	NJ joins RGGI in 2020 (modeled as emissions capped as part of RGGI)	NJ joins RGGI in 2020 (modeled as emissions capped as part of RGGI)
RGGI Emissions Trajectory	2.5% annual decline in RGGI Cap from 2020-2030; cap held constant post-2030	RGGI's 2020-2030 new model rule

NRDC's IPM Modeling Shows Both Economic and Health Benefits in Virginia under the Proposed Rule, Similar to Those Already Experienced in RGGI States

Limiting power sector carbon pollution will benefit Virginia's economy and public health.

In addition to a 2018 "business-as-usual" baseline case with no carbon limit, ICF also conducted an IPM run in which Virginia emissions are included in the RGGI program starting in 2020. (In this case, Virginia's cap was based on the VA DEQ's originally proposed and higher baseline of 33 million tons, but with an annual 3% reduction 2021-2030.)

This carbon policy IPM modeling shows that Virginia can significantly reduce carbon emissions without hampering energy affordability. In addition, IPM modeling shows a well-designed program and allowance allocation process can drive significant ancillary economic, energy independence, and public health benefits for families and businesses in the Commonwealth.

Retail Rates and Bills Are Not Negatively Impacted by Linking to RGGI

Reflecting the aforementioned economic competitiveness of renewables and other lower-emitting resources, NRDC's IPM modeling shows no meaningful impact on retail rates or bills between a no carbon policy and carbon policy case. Indeed, retail rates and bills *are slightly lower* with the carbon policy included. (See Tables 4 and 5.)

Tables 4 and 5: Decreased Rates and Increasing Clean Energy

Retail Rates (2012\$/MWh)			
State	2020	2025	2030
No Carbon Policy	\$ 99.60	\$ 98.10	\$ 96.60
VA in RGGI	\$ 99.00	\$ 97.60	\$ 96.00

% Change in Final Bill versus "No Carbon Policy"			
State	2020	2025	2030
VA in RGGI	-0.6%	-0.4%	-0.6%

The above modeling results are intuitive, when one considers the aforementioned decline in renewable prices and the increasingly marginal status of Virginia’s no-longer-competitive coal units.

Notably, the modeling scenarios above do not include the impact of additional energy efficiency or energy savings, including those to be made under 2018’s Grid Transformation and Security Act. If the SCC directed allowance revenue toward energy efficiency programs, as has been shown to be effective in the successful RGGI program,³³ bills and rates could be even lower under an improved final rule.

Carbon Costs: Carbon Allowances Prices Will be Modest

NRDC’s modeling shows RGGI allowance prices will continue to be modest, even with the inclusion of Virginia’s emissions. (See Figure 6 below.)

Figure 6: Projected Carbon Allowance Prices in NRDC IPM Modeling

RGGI Carbon Allowance Prices (2012\$/Ton)			
State	2020	2025	2030
No Carbon Policy	3.57	3.93	4.42
VA in RGGI	3.45	3.78	4.24

In the preliminary case above, in which Virginia joins RGGI (reflecting the rule as initially proposed), the carbon allowance price is lower in the 2020-2030 period as compared to RGGI allowance prices absent Virginia’s participation. This reflects the expected beneficial effect of increased that Virginia would bring to the larger RGGI market.

Health Impacts: A RGGI-linked Virginia Carbon Cap Will Directly Improve State Health

Reducing carbon pollution also significantly reduces the co-pollutants nitrous oxide (NOx) and sulfur dioxide (SO₂). Specifically, by 2030, the state would reduce NOx emissions by an additional 2,700 tons and SO₂ emissions by an additional 400 tons. (See Figure 7 below.)

³³ See, e.g., RGGI, “The Investment of RGGI Proceeds through 2014,” September 2016, *available at* https://rggi.org/sites/default/files/Uploads/Proceeds/RGGI_Proceeds_Report_2014.pdf.

Figure 7: Health Improvements by Reducing Co-Pollutants

Thousand Short Tons	2020		2025		2030		% Reduction
	VA in RGGI	No Carbon Policy	VA in RGGI	No Carbon Policy	VA in RGGI	No Carbon Policy	
Emissions - NO _x	9.45	11.56	8.77	10.68	7.97	10.74	-26%
Emissions - SO ₂	4.01	4.58	3.94	4.37	4.09	4.50	-9%

The reductions above represent a reduction in annual NO_x and SO₂ emissions of 26 percent and 9 percent, respectively, by 2030, another public benefit that must be considered as the DEQ contemplates approval of this well-justified rule.
